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Parents' Perspective on Diversifying the STEM Education to Career Pipeline: Motivating Culturally and Linguistically Diverse Gifted/ Talented Students to engage in STEM

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Parents' Perspective on Diversifying the STEM Education to Career Pipeline: Motivating Culturally and Linguistically Diverse Gifted/Talented Students to engage in STEM

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According to the National Action Council for Minorities in Engineering (NACME), there is a lack of diversity in STEM (science, technology, engineering and mathematics) education and careers. The 2013 U.S. Census Bureau indicates that Blacks and Latinos are underrepresented in STEM, with each group making up less than 7% of the STEM workforce; while Whites are overrepresented, making up 70% of the workforce (2013). However, the 2016 Illinois STEM report card suggests that 24% of Black and 28% of Hispanic high school students are interested in STEM. The Research Consortium on STEM Career Pathways further indicates that 21% of Blacks and 27% of Latinos aspire to enter a STEM careers. Although approximately a quarter of Black and Latino students are interested in STEM and aspire to enter STEM fields, they have not demonstrated academic proficiency in math and science education. This is evident in the National Assessment of Educational Progress (NAEP), which shows that while 32 percent of White students and 47 percent of Asian students scored at proficient or above in math, only 7 percent of Black students and 12 percent of Latino students did (2013). In science, the average score was 163 for White students and 159 for Asian students, but 129 for Black Students and 137 for Latino Students (NAEP, 2011). Although these disparities exist, NACME believes that diversity in STEM leads to improved decision-making, enhanced innovation and better outcomes for business, and thus, have prioritized diversifying the STEM education to career pipeline (2011). They have implemented a 3-prong plan to address the issue that includes raising reading, math and science scores, training more teachers in STEM education, and encouraging more underrepresented minorities to enter STEM fields.

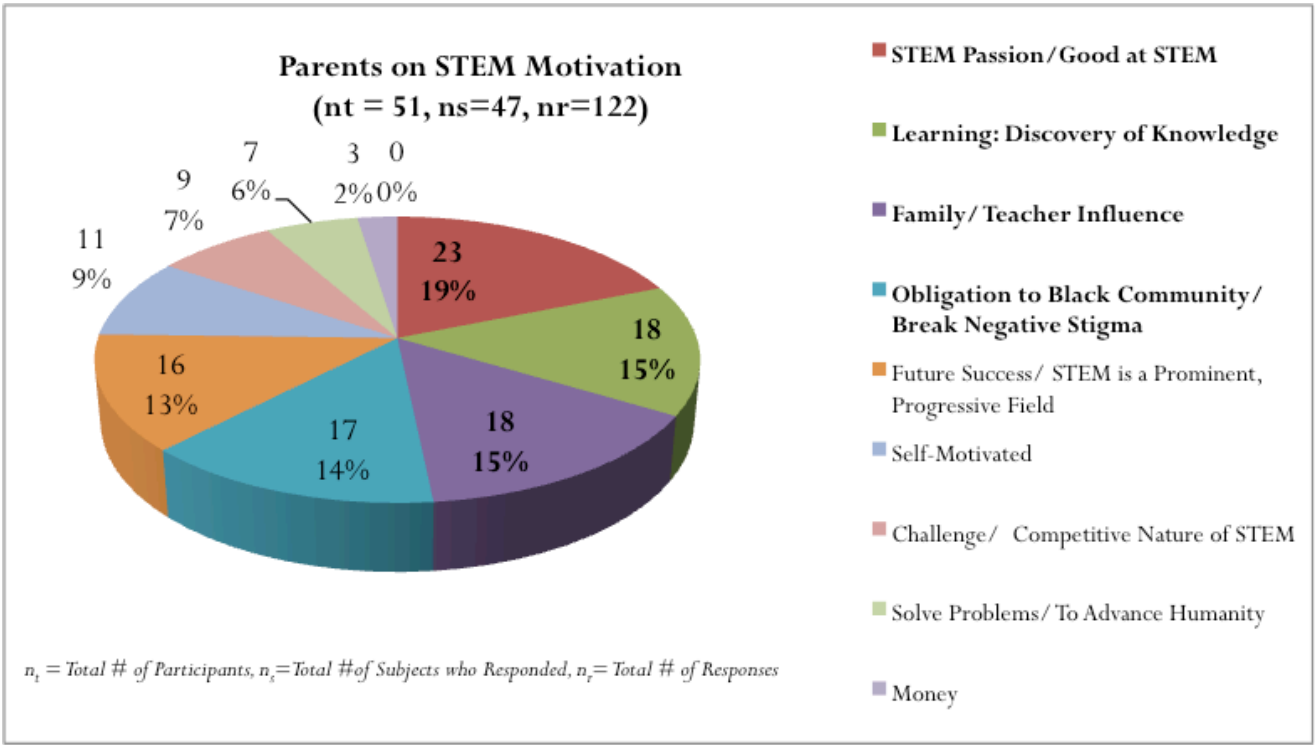
The National Association of Gifted Children (NAGC) also sees its' importance and has stated that "having an adequate, diverse, and well-trained supply of scientists and engineers depends, in part, on what thousands of high-ability students decide every year to do with their lives". They have provided the following recommendations to encourage STEM excellence in gifted students:

- **Create specialized classes** to provide rigorous and challenging material to our most capable learners,
- **Expand the number of selective math-science high schools,**
- **Train teachers to recognize giftedness** and address the unique needs of gifted and talented students.

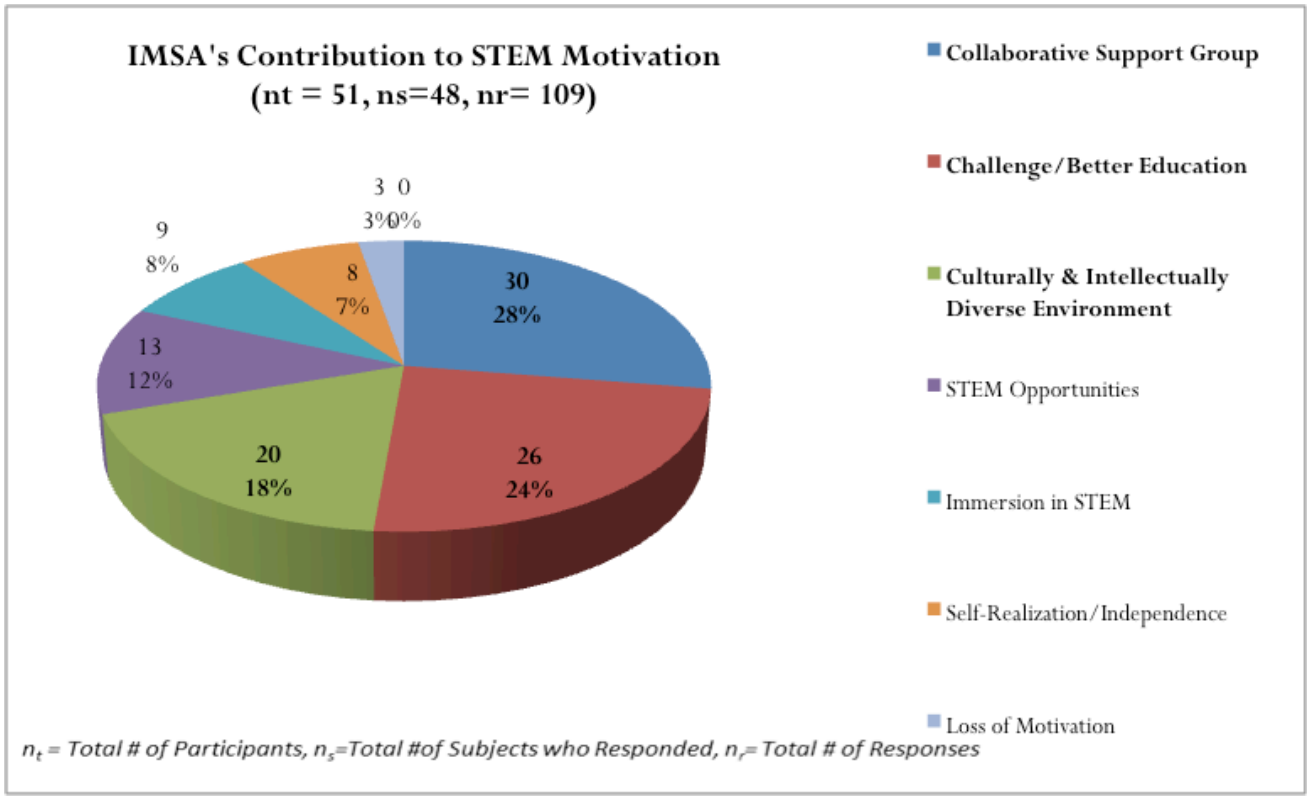
The Illinois Mathematics and Science Academy (IMSA), a residential high school for students who are gifted/talented in mathematics and science is an example of the application of NAGC's recommendations. In an effort to better serve and inform programs/services for Black and Latino students, IMSA conducted a study that explored their motivation to engage in STEM. This study took an intricate look at STEM motivation as well as the STEM gap and how to bridge that gap from the perspectives of Black and Latino students, alumni and parents. The remainder of this article will focus on the exploration from the perspective of 51 parents of Black and Latino students enrolled at IMSA, inclusive of 21 Black male parents, 10 Black female parents, 10 Latino male parents and 10 Latino female parents. Their perspective will provide you, the reader, with insight on how to motivate your student to engage in STEM education, defined as:

an interdisciplinary approach to learning where rigorous academic concepts are coupled with real-world lessons as students apply science, technology, engineering, and mathematics in contexts that make connections between school, community, work, and the global enterprise enabling the development of STEM literacy and with it the ability to compete in the new economy (National Center on Gifted and Talented, 2013).

When asked why there is a STEM gap that disproportionately impacts Black and Latino students, the most common themes to emerge were lack of STEM vision, lack of quality STEM education and lack of STEM parent support. Regarding lack of STEM vision, the parents believed their student did not have role models of the same race engaged in STEM and that STEM is not encouraged in the Black and Latino communities. They further believed, prior to enrolling at IMSA, their students were not challenged in STEM areas and were provided with inadequate academic exposure. Although the parents were supportive of their students' academic endeavors, they were not STEM professionals and thus, needed education on STEM resources/opportunities. Below is the frequency of response of the themes to emerge about why a STEM gap:



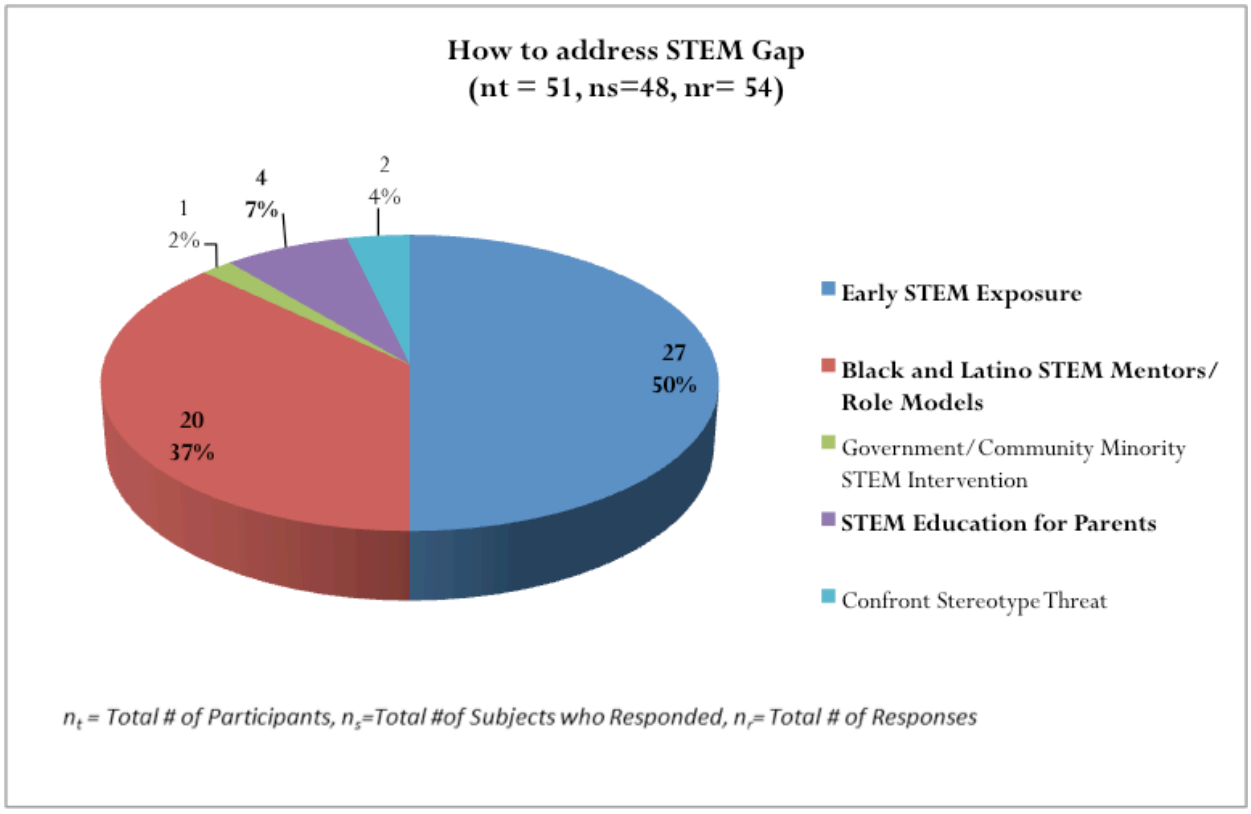
The parents were further asked, despite the STEM gap research, what motivated their child to engage in STEM education. The most frequent themes to emerge include STEM passion/good at STEMlearning, family or teacher influence, and obligation to community or desire to break negative stigmas. Some of the parents suggest that their students possess an innate STEM ability, while others suggest that through exposure, their student developed a passion for STEM. This ability and/or passion is nurtured by both STEM teachers and family members engaged in STEM. A profound factor of motivation is the obligation the students have to their community to be role models, contribute to economic development, and make their ancestors proud, ultimately breaking negative stigmas that society has of them. Below is a table of the frequency of responses on what motivates gifted/talented Black and Latino students to engage in STEM education:



Next, the parents were asked how IMSA has contributed to their students' motivation to engage in STEM education. The most common themes to emerge include: collaborative support group, provision of challenge and a better education and being in a culturally/intellectually diverse environment. The parents believe that the immersion in STEM in and out of the classroom through a model of collaboration with culturally and linguistically diverse students, as well as diverse perspectives enhanced motivation in their students. They further agree that IMSA's rigorous academic education that prepares students for future success motivated their students.

The final question responded to by parents of gifted and talented Black and Latino students was how to address the STEM gap. The two most frequent responses were early STEM exposure and Black and Latino STEM mentors and role models. The parents also agree that involvement in STEM outside of class was important in developing STEM motivation. This exposure should begin early in elementary school and continue throughout their academic career. They further stated that having mentors and role models of similar race and/or ethnicity will help students create a vision of

success as way of STEM. Although not significant, some parents suggest the need for STEM education for parents to help them support their students' STEM endeavors. Below is a table of the frequency of responses on addressing the STEM gap:



The parents of gifted and talented culturally and linguistically diverse (CLD) gifted students enrolled at the Illinois Mathematics and Science Academy have students who are motivated to engage in STEM education and are aspiring to enter a STEM field.

Below are some resources that IMSA parents have utilized and may assist parents of gifted and talented CLD students in motivating their student to engage in STEM education:

Illinois Mathematics and Science Academy-PROMISE (providing opportunities for mathematics and science enrichment)

Serving underrepresented and economically disadvantaged students who have talent and interest in mathematics and science is a high priority of the Illinois Mathematics and Science Academy. IMSA believes in addressing the challenges of underrepresented and economically disadvantaged students through contact and intervention in the form of academic enrichment programming early in students' educational experience. The Academy continues

to create and develop a culturally rich and inclusive environment that affirms and celebrates individual differences. **https://www.imsa.edu/extensionprograms/statewidestudentinitiatives**

https://www.imsa.edu/admissions/promise

Northwestern University – Center for Talent Development

The Center for Talent Development (CTD) at Northwestern University is dedicated to helping gifted and talented students, age 4 through grade 12, reach full potential. CTD provides research-based assessment, advanced academic programs in all content areas including STEM, and resources to enhance gifted education and guide students in developing their talents. Programs run on weekends, during the summer and online. https://www.ctd.northwestern.edu/

FermiLab Target Program for Diversity and Inclusion

The TARGET Program is a highly competitive, paid, six-week summer internship opportunity for Illinois high school sophomores and juniors who have strong interest and demonstrated aptitude for physics, mathematics, computer science and engineering. The program's goals are to encourage high school students to undertake college study and pursue careers in STEM disciplines. TARGET encourages and aims to increase the representation of underrepresented minorities (Black, Hispanic, Hawaiian/Pacific Islander, Alaska Native/American Indian) and women in the sciences and engineering at the college level and consequently the workforce. http://diversity.fnal.gov/target/

National Society of Black Engineers (NSBE Jr.)

The Pre-College Initiative (PCI) program is designed to stimulate the interest in science, technology, engineering, and mathematics fields, or STEM. The goal is to encourage students in grades K–12 to attend college and pursue technical degrees. The PCI program provides activities to help students discover firsthand how engineering and technology relate to the world around them and discover the excitement of academic excellence, leadership, technical development and teamwork. http://www.nsbe.org/NSBE-Jr/Welcome.aspx

Society for Hispanic Professional Engineers (SHPE Jr.)

SHPE Jr. Chapters provide high school students with opportunities to participate in hands-on STEM activities, receive mentoring, and experience STEM firsthand at a

participating local university or museum. Members are also eligible to attend the precollege symposium held at SHPE's National Conference, participate in academic and engineering summer camps, compete in National Science Bowls, participate in local science fairs, and engage with SHPE Student and Professional chapters. http://programs.shpe.org/high-school/

National Association for the Advancement of Colored People (NAACP) – ACT-SO

The NAACP's Afro-Academic, Cultural, Technological and Scientific Olympics is a yearlong achievement program designed to recruit, stimulate, and encourage high academic and cultural achievement among African-American high school students. http://www.naacpconnect.org/pages/what-is-act-so

Shades of Blue

SHADES of BLUE is a non-profit educational organization dedicated to mentoring, tutoring, counseling, and arranging internship and employment referrals for young people who desire to pursue Science, Technology, Engineering, and Mathematics (STEM) careers. SHADES of BLUE is committed to fostering careers for all interested students. Within the organization are numerous professionals that provide a support system for mentoring and job placement that will maximize the probability of success for the students who chose a career in STEM. To achieve its goal, SHADES has developed a system to identify and track its student members from elementary school through college. In addition, SHADES has developed partnerships and strong relationships with many businesses and educational entities within the STEM-oriented fields, thus providing graduates with potential future employment and/or educational opportunities. Although SHADES primarily focuses on aviation and aerospace, the same level of assistance across all elements of STEM is available to all student members.http://www.ourshadesofblue.org/chapter-leaders/

Girls for Science

Girls 4 Science is a nonprofit organization dedicated to exposing girls in Chicago, ages 10-18 years old to STEM. The focus is on developing skills, self-esteem, opportunity awareness, as well as relationship building that will help girls overcome barriers that may prevent them from achieving greater success in STEM careers. http://www.girls4science.org/

Cisco Networking Academy – Get Connected

Cisco Networking Academy is an IT skills and career building program for learning institutions and individuals worldwide. Get Connected introduces you to computer basics and Internet navigation skills. https://www.netacad.com/courses/get-connected/

Quad County Urban League

Tomorrow's Scientists, Technicians, and Managers (TSTM) exposes minority middle and high school students (6-12) to STEM (Science, Technology, Business and Math) and business fields while also offering tutoring sessions, field trips, supervised projects and summer programming. http://qcul.org/education-4/

IMSA – IN2

IN2 is designed to ignite collaboration and entrepreneurial activity among students, educators, business and the community to solve real-world problems, design prototypes and launch new ideas to advance the human condition. IN2 focuses on the four areas of STEM and innovation: entrepreneurship education, teaching and learning, maker movement and diversity. https://www.imsa.edu/in2